Table 3A.—Free-air resultant winds based on rawin observations made near 0300 G. C. T., during the year 1949. Directions given in degrees from north ($N=360^{\circ}$, $E=90^{\circ}$, $S=180^{\circ}$, $W=270^{\circ}$). Speeds in meters per second

	Albuquer- que, N. Mex. (1,636 m.)			Big Spring, Tex. (774 m.)			Bi	Bismarck, N. Dak. (505 m.)				c	Caribou, Maine (191 m.)		to	Charleston, S. C. (13 m.)		Co	Columbia, Mo. (237 m.)		Grand Junction, Colo. (1,473 m.)		Greens- boro, N. C. (275 m.)		ıs- . C.	н	Hatteras, N. C. (3 m.)		tional Min		Interna- onal Falls, Minn. (358 m.)		Littl ck, A 80 m	ttle , Ark. m.)		dford, reg. 1 m.)		
Altitude (meters) m. s. l.	Observations	- 1		Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction		Observations	Direction	Bpeed	Observations	Direction	Speed		Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed		Direction			Direction	Speed	Observations	Direction	ı I		Direction
Surface	365 364 364 362 361 354 344 300 256	131 	1. 2 2. 1 3. 6 4. 7 6. 5 7. 6 8. 8 10. 1 12. 3	362 361 361 360 360 360 358 348 332 309	141 159 185 214 234 248 262 263 260 261	3. 1 4. 9 5. 0 4. 7 5. 0 6. 8 8. 8 11. 9	363 358 356 353 351 350 344 338 330 289 243	300 291 299 293 293 291 287 282 271 264	0. 8 2. 1 4. 2 6. 0 7. 5 8. 8 11. 1 12. 4 14. 1 16. 3 17. 3	361 355 354 353 354 354 351 349 352 347 335 296 216	118 130 140 152 172 193 213 242 247 251 255 261 270	2. 5 5. 9 5. 8 2. 5 2. 5 7. 1 10. 8 13. 6 12. 3	365 365 365 360 355 348 346 336 320 305 256	267 265 274 275 275 274 271 268 268 268	1. & 4. 4 6. 1 7. 2 8. 3 9. 7 11. 1 13. 4 15. 1 16. 8 18. 8	365 363 361 360 360 357 353 344 329 311 265 223	210 219 236 254 263 268 268 268 270 276 281	0. 4 2. 0 2. 1 3. 3 4. 1 5. 1 6. 0 7. 4 8. 6 9. 8 10. 8	4 364 0 364 5 361 3 360 1 358 1 355 0 351 4 342 5 330 5 316 5 270	145 198 234 252 264 270 274 279 278 277	0.7 2.6 4.0 5.3 6.4 7.3 8.1 9.6 11.6 12.9 14.9	365 363 363 363 364 362 357 351 305 236	60 230 235 245 260 265 269 272 271	0. 2 1. 1 2. 4 3. 6 5. 3 7. 2 9. 0 11. 4 12. 8	364 361 360 358 357 356 354 346 340 321 291 237	282 243 251 261 266 270 269 269 270 273 272 274	0.3 1.6 3.6 4.7 5.6 6.8 7.9 9.7 11.4 12.7 15.4 16.6	365 363 360 353 347 343 337 322 312 292 249 182	245 241 250 261 268 267 268 268 271 273 277 282	0. 7 2. 5 3. 3 4. 1 5. 0 7. 0 9. 2 10. 7 11. 8 13. 0 12. 1	365 362 362 359 359 356 356 343 330 319 278 221 142	246 238 263 281 281 285 288 283 276 273 274 273	0. 7 1. 8 4. 1 5. 3 6. 5 7. 7 9. 0 11. 4 13. 9 15. 4 18. 1 20. 1 22. 1	365 360 359 356 353 345 342 332 323 307 274	218 174 214 233 245 251 255 259 262 260 254	0. 4 2. 1 3. 1 4. 1 5. 1 6. 1 7. 3 9. 0 10. 1 11. 3 14. 3	364 360 359 357 355 348 347 342 328 304 241	323 1.6 320 2.0 305 2.3 276 2.1 260 2.6 259 3.8 256 4.5 267 6.0 272 7.9 272 8.8 258 10.9
	N (1	liam Fla. 12 m.	i,)	Nas I	ntuc Mass 13 m	ket,	N ₅	shvi Fenr 80 п	ille, 1. 1.)	0	New rlean La. 6 m.	s,	Os	aklar Calif (8 m.	nd,)	Ol Cii	rlaho ty, O 392 m	ma kla. 1.)	Rai S (g	pidC . Da 980 m	ity, k. 1.)	St.	Clo Minr 18 m	ud, i.	ton (2	an A io, T 142 m	n- 'ex.	Sa;	n Jus P. R. 28 m.	in,	S N (7	ante faria 'alif '2 m	a, .,	Sa I	ult S Marie Mich 21 m	te.	Spc W (72	kane, ash. 8 m.)
Surface	365 364 364 364 365 365 360 356 354 341 321 280 203	80 105 105 99 105 127 169 248 269 274 279 281 297	1. 2 3. 5 3. 2 2. 4 1. 7 1. 1 1. 5 3. 3 4. 8 8. 6 9. 7 1. 8	352 349 347 346 340 337 333 322 304 283 178	257 262 274 274 273 271 270 269 268 269 272	1. 2 4. 7 5. 4 6. 3 8. 0 9. 2 10. 3 12. 3 14. 1 15. 0	365 363 362 356 354 353 350 342 329 309 257	208 207 228 249 259 263 267 271 270 268	0. 5 2. 2 3. 8 4. 6 6. 0 7. 2 8. 8 10. 7 12. 1 12. 8	363 360 357 358 359 352 351 344 335 322 278 230	113 144 170 208 238 248 254 259 261 262 263 265	0.8 1.9 1.3 1.3 2.3 3.5 4.5 7.0 9.2 11.0 3.3 4.9	365 364 364 363 363 363 361 356 346 332 295 246	277 288 289 292 294 294 291 290 289 290 280 278	3. 0 3. 1 2. 8 2. 3 2. 1 2. 6 3. 3 4. 6 5. 9 7. 7 9. 7 11. 4	353 330 325 329 335 335 334 320 275 243	138 150 192 226 248 255 262 269 271 271 271	2. 0 4. 0 4. 4 5. 1 5. 9 6. 8 7. 7 8. 6 10. 3 12. 3 14. 0	359 356 357 355 354 345 322 309 3299 3258	295 290 291 290 288 287 284 283 280 257	0. 9 3. 0 4. 5 6-2 7. 6 9. 9 11. 2 13. 0 9. 5	362 359 358 349 341 333 324 309 269 225	322 238 256 267 273 286 285 282 278 278 276 273			93 119 143 174 210 235 248 256 259 260 264	2. 6 4. 2 4. 5 3. 4 3. 1 3. 9 4. 5 6. 4 8. 3 10. 0 13. 1	364 361 359 355 355 353 352 349 344 336 322 315 298 249	98 90 90 89 87 87 85 80 66 48 299 285 280 282	2. 9 6. 4 6. 6 5. 5 5. 2 4. 8 2. 5 2. 0 3. 5 9. 3 4. 4 2. 2	365 363 364 363 362 361 361 357 351 341 316 279 227 179	281 331 337 351 341 319 304 293 284 285 280 266 263 264	1. 6 2. 7 2. 6 2. 1 2. 8 3. 7 5. 4 7. 0 9. 7 12. 6 13. 9	362 362 358 351 346 340 335 321 301 273	306 250 259 268 278 281 276 279 282 279	0. 6 1. 8 4. 4 5. 9 7. 0 8. 3 0. 5 12. 0 13. 4 14. 6	357 354 349 348 330 334 326 314 293 230	205 1.7 222 3.1 241 4.2 251 4.7 260 4.8 267 5.6 269 7.7 272 9.8 272 10.6 260 11.6
															ato(osh Was 33 m	Islandh.	d,																	7	Catoo V (3)	sh Is Vash 33 m.	land,
Surface															351 344 338 337 338 336 331 321	16 22 23 23 24 25 26 26	6 9 6 9 9 7 2 4	1. 5 2. 2 2. 9 3. 4 4. 1 4. 9 5. 9 7. 8	8,0 10 12 14	,000 ,000 ,000 ,000															-	307 289 245 189	266 266 277 266	10 1

NOTE.—Resultants prepared from rawins at high altitudes are biased toward lower wind speeds. Values appearing in this table should therefore be used with caution when

the number of observations missing is greater than three. See note following Table 3 in the June 1948 issue of the Monthly Weather Review.

RIVER STAGES AND FLOODS FOR DECEMBER 1949

The highest crests since 1937 occurred along the Green River in Kentucky during December. Flooding elsewhere was mostly light except along the Wabash River where overflows were moderate. A serious flood threat was averted in the Puget Sound drainage by the onset of colder weather.

Atlantic Slope drainage.—Precipitation averaged mostly below normal along the Atlantic Slope drainage during the last 3 months of 1949 except in Pennsylvania. Despite the deficient rainfall, rivers in the northern portion of the New England States were slightly higher at the end of the month than in the beginning due mostly to runoff from snowmelt. By the 31st most of the snow cover in the headwater areas had disappeared.

General rains over the upper reaches of the Delaware River, together with some melting of the snow cover caused a sharp rise at Port Jervis, N. Y., and Trenton, N. J., on the 14th and 15th but flood stages were not reached. Light flooding occurred in the Graters Ford area for a few hours on the 27th due to heavy local rains over Perkiomen Creek.

Mississippi System.—Upper Mississippi Basin.—Slight flooding occurred along the Illinois River at Morris, Ill., and along the Meramec in Missouri from the heavy rains which averaged slightly over 3 inches in the Illinois Basin and 1.75 inches in the Meramec Basin on the 21st and 22d. No damage resulted.

The Upper Mississippi River at and above Dam 10 remained at near normal pool stage throughout December. The river was officially closed to navigation at LaCrosse, Wisc., on the 14th when it froze over from shore to shore. Upper pools No. 7 and 8 were frozen over with a thin coating of ice as early as the 9th.

Ohio Basin.—A general rain beginning on the 10th and continuing through the 14th caused moderate to heavy rises in streams in the basin with the highest crests since 1937 on the Green River in Kentucky. The rainfall over the Green and Barren basins during this period averaged between 6 and 7 inches with one station reporting a total of 9.24 inches. Both streams were overflowing before the rainfall ceased and crested 8 to 13 feet above bankfull stage. Nearly an additional inch of rain

on the 18th and 19th delayed as well as contributed to the crests downstream and slowed down the fall upstream.

Sharp rises occurred in all the southern tributaries of the Ohio River but no flooding occurred except in the Little Kanawha at Glenville, W. Va. A considerable rise followed on the Ohio River. Dam 29 rose from a pool condition at 15 feet to a crest of 36 feet in 3 days, but flood stages were not exceeded anywhere on the Ohio River.

On the 22d and 23d rains averaging over 2 inches covered the upper Wabash. These were followed by additional rain of about an inch over the entire basin on the 26th and 27th. The combined effect of these two storms produced moderate flooding at Wabash, Ind., and at all points from LaFayette, Ind., downstream to Mt. Carmel, Moderate rises occurred on practically all other tributaries, but no flooding occurred. No serious damage resulted, but some county and low lying State roads in the area from LaFayette, Ind., downstream were inundated for a short period. Rains were much lighter over the East and West Forks of the White but no flooding occurred except at Edwardsport, Ind.

Lower Mississippi Basin.—Heavy rains (about 3 inches) near the middle of the month over the St. Francis Basin caused rises to within a few feet of flood stage at Fisk, Mo., and St. Francis, Ark. Additional rain on the 18th, 22d and 26th caused an additional rise at St. Francis, Ark., to above flood stage on the 29th which continued into January.

Heavy rains on the 10th and 12th caused light flooding on the Coldwater River at Sarah, Miss., on the 12th and 13th. Little if any damage occurred as a result of the overflow.

Rains over the Mississippi Valley were sufficient to cause a rise of approximately 20 feet at stations on the Mississippi River during the last half of the month but no

flooding occurred.

West Gulf of Mexico drainage.—Light flooding occurred on the Sabine River at Bon Weir, Tex., on the 19th and 20th due to heavy rain on the 17th. The river was about 4 feet below bankfull stage before this rain occurred.

The Trinity approached within one foot of bankfull stage at Liberty, Tex., on the 16th from the rain (2 to 3 inches) between the 9th and 15th in the lower Trinity

basin.

Puget Sound and Washington Coast drainage.—Light overflows occurred along the Chehalis and streams in the Puget Sound drainage from the heavy rain and melting snows during the last week in December. Rains occurred almost daily over western Washington from the 23d to the end of the month with excessive amounts ranging up to 1.5 inches on the 27th and 2.85 inches on the 28th in some basins. The snow line was estimated to be between 500 and 1,000 feet. Snowmelt was a considerable factor.

According to State Highway Department reports, the snow depth on Snoqualmie Pass decreased from 80 inches on the 27th to 53 inches on the 28th and on Stevens Pass from 110 inches on the 27th to 90 inches on the 28th. Temperatures in the lower valleys reached 50°-56° from the 27th to the 29th and temperatures were slightly above freezing up to about 4,000 feet during this period. Colder weather and less rain on and after the 29th halted this serious flood threat.

FLOOD STAGE REPORT FOR DECEMBER 1949

·							
River and station	Flood	Above stages-	flood dates	Crest 1			
	stage	From—	То—	Stage	Date		
ATLANTIC SLOPE DRAINAGE	Feet			Feet			
Perkiomen Creek: Graters Ford, Pa	8	27	27	10. 2	27		
MISSISSIPPI SYSTEM Upper Mississippi Basin							
••			00	10.0	~		
Illinois: Morris, Ill	13	23	23	13.8	23		
Sullivan, Mo Pacific, Mo	11 11	23 23	23 24	12.0 13.5	23 24		
Ohio Basin		1					
Little Kanawha: Glenville, W. Va Barren: Bowling Green, Ky Rolling Fork: Boston, Ky	23 28	13 13 13.	13 16 17	23. 1 36. 9 44. 5	13 14 15		
Groon:		İ					
Mundfordville, Ky	23 28	13 12	16 18	36.4 40.7	15 15		
Lock No. 4, Woodbury, Ky	33 34	12 15	22 29	46, 7 41, 1	16 23		
West Fork: Edwardsport, Ind	12	/ 13	13 30	12. 2 13. 8	13 24		
Wabash: Wabash, Ind	12	23	30 23	14.8	22		
Lafavette, Ind	i	{ 22 28	25 29	} 17.5	23		
Covington, Ind.	16	23	30	20.6	25		
Montezuma, Ind Terre Haute, Ind	14	23	(2)	21.1 17.8	27 27 29		
Hutsonville, IllVincennes, Ind	16	29	(2)	20.9 17.5	29 31		
Lower Mississippi Basin	10	20		1,,,,			
Coldwater: Sarah, Miss	18 18	12 29	(3)	19. 2 18. 5	13 31		
WEST GULF OF MEXICO DRAINAGE							
Sabine: Bon Weir, Tex	17	19	20	17.3	19		
PACIFIC SLOPE DRAINAGE							
Chehalis Basin	i						
Satsop: Satsop, WashChehalis:	34	28	28	34.8	28		
Centralia, WashGrand Mound, Wash	63 14. 5	28 29	29 29	64. 7 14. 8	28 29		
Puget Sound							
Snohomish: Snohomish, Wash Snoqualmie: Tolt, Wash Stillaguamish: Arlington, Wash	23. 6 51. 5 16	28 28 28	28 28 28	26. 6 53. 7 17. 9	28 28 28		

Provisional.
Continued at end of month.